NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA

(An Autonomous Institute Affiliated to AKTU, Lucknow)

B.Tech

SEM: IV - THEORY EXAMINATION (2022-2023 .)

Subject: Operations Research

Time: 2 Hours   **Max. Marks: 50**

General Instructions:

IMP: *Verify that you have received the question paper with the correct course, code, branch etc.*

1. *This Question paper comprises of* **three Sections -A, B, & C.** *It consists of Multiple Choice Questions (MCQ's) & Subjective type questions.*

2. *Maximum marks for each question are indicated on right -hand side of each question.*

3. *Illustrate your answers with neat sketches wherever necessary.*

4. *Assume suitable data if necessary.*

5. *Preferably, write the answers in sequential order.*

6. *No sheet should be left blank. Any written material after a blank sheet will not be evaluated/checked.*

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SECTION A   **15**

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1. Attempt all parts:-

1-a.   Who defined OR as scientific method of providing executive departments with a quantitative basis for decisions regarding the operations under their control? (CO1)   1

         (a) P.M.S. Blackett (1948)

         (b) E.L. Arnoff and M.J. Netzorg

         (c) Morse and Kimball (1946)

         (d) None of these

1-b.   In a LPP with m restrictions in n variables, the maximum number of basic feasible solutions are(CO2)   1

         (a) $^{n}C_{m+1}$

         (b) $^{n}C_{m-1}$

         (c) $^{n}C_{m}$

         (d) $^{n}C_{m-2}$

1-c.   In Hungarian method in marking assignments, which of the following should be preferred? (CO3)   1

(a) Only row having single zero

(b) Only column having single zero

(c) Only row/ column having single zero

(d) Row having more than one zero

1-d. In program evaluation review technique network each activity time assume a beta distribution because__(CO4)　　1

(a) It has got finite non-negative error

(b) It is a unimodal distribution that provides information regarding the uncertainty of time estimates of activities.

(c) It need not be symmetrical about model value

(d) None of these

1-e. Simulation is (CO5)　　1

(a) Descriptive in nature

(b) Useful to analyse problems where analytical solution is difficult

(c) A statistical experiment as such its results are subject to statistics errors

(d) All of these

2. Attempt all parts:-

2.a. Discuss advantages and limitations of Operations Research.(CO1)　　2

2.b. Define convex set. Give an example of convex set. (CO2)　　2

2.c. What is an unbalanced transportation problem? How to covert it into a balanced transportation problem ? (CO3)　　2

2.d. Distinguish between float and slack . (CO4)　　2

2.e. What are Pseudo-random numbers? (CO5)　　2

SECTION B　　15

3. Answer any three of the following:-

3-a. What is a model? Discuss various classification schemes of models . (CO1)　　5

3-b. Solve the following LPP by using Big $-$ M method: Max $z = 3x_1 + 2x_2$　　5

Subject to $2x_1 + x_2 \leq 2$

$3x_1 + 4x_2 \geq 12$

$x_1, x_2 \geq 0$　　(CO2)

3.c. Use Vogel approximation method to determine an initial basic feasible solution to the following transportation problem: (CO3)　　5

	A	B	C	Supply
P	2	7	4	5

Q	3	3	1	8
R	5	4	7	7
S	1	6	2	14
Demand	7	9	18	

3.d. The following table shows the jobs of a network along with their time estimates. The time estimates are in days. (CO4) **5**

Job	1-2	1-6	2-3	2-4	3-5	4-5	5-8	6-7	7-8
a	3	2	6	2	5	3	1	3	4
m	6	5	12	5	11	6	4	9	19
b	15	14	30	8	17	15	7	27	28

   i. Draw the project network.

   ii. Find the critical path and total project duration.

3.e. In a railway marshalling yard, goods trains arrive at a rate of 30 trains per day. Assuming that the inter-arrival time follows an exponential distribution and the service time(the time taken to hump a train) distribution is also exponential with an average 36minutes.Calculate the following: (CO5) **5**

i) The average number of trains in the queue.

ii) The probability that the queue size exceeds 10.

SECTION C **20**

4. Answer any <u>one</u> of the following:-

4-a. Define Operation Research? What areas of Operations Research have made a signi ficant impact on decision making process? (CO1) **4**

4-b. Discuss the various steps used in solving Operations Research problems .(CO1) **4**

5. Answer any <u>one</u> of the following:-

5-a. Solve the following LP problem : (CO2) **4**

Maximize Z = 3x + 9y

s.t. x + 4y ≤ 8

x + 2y ≤ 4

Both x and y all ≥ 0.

5-b. Prove that a hyperplane in is a convex set. (CO2) **4**

6. Answer any <u>one</u> of the following:-

| 6-a. | Define transportation problem. Distinguish between Assignment problem and transportation problem. (CO3) | 4 |

| 6-b. | There are four jobs to be assigned to five machines. Only one job can be assigned to the machine. The amount of time in hours required for the jobs per machines are given in the following matrix: (CO3) | 4 |

By using the assignment method, find the assignment of mechanics to the job that will result in maximum profit. Which job should be declined?

7. Answer any <u>one</u> of the following:-

| 7-a. | It is given that the set-up cost is Rs. 100, the daily holding cost per unit of inventory is 5 paise and the daily demand is approx. 30 units. Determine the: (CO4) | 4 |

    i. Economic lot size
   ii. The associated total cost.

| 7-b. | What is the critical path method (CPM)? What is the difference between PERT and CPM? (CO4) | 4 |

8. Answer any <u>one</u> of the following:-

| 8-a. | What is meant by Monte-Carlo method of simulation? Discuss its scope . (CO5) | 4 |

| 8-b. | Explain briefly the main characteristics of queuing system. and also Describe the fundamental components of a queueing process ? (CO5) | 4 |